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## DETAILED DESCRIPTION

## [Detailed Description of the Invention]

[0001]

[Industrial Application]Concerning an LED lighting implement still in detail, this invention relates to the LED lighting implement which surrounds the LED tip with which the printed circuit board was equipped in the resin molding which has a lens characteristic.

[0002]

[Description of the Prior Art]The LED lighting implement which carries a LED tip in a printed circuit board is variously proposed from the former as a component of exterior illumination light, an alarm lamp, the lighting fixture for vehicles, a display device, etc. The easiest LED lighting implement of composition attaches the LED discrete lamp 31 of a required number to the applicable position of the printed circuit board 32, and solders (refer to drawing 3).

[0003]The printed circuit board 41 is directly equipped with LED tip 42, and the LED lighting implement of composition of coming to stick the light reflector 43 and the lens plate 44 on this order further is proposed (refer to drawing 4). In adopting the LED lighting implement of this composition, Since what is necessary is to equip the printed circuit board 41 only with LED tip 42, and the process for manufacturing an LED discrete lamp can be made unnecessary and the immediate printing board 41 is moreover equipped with LED tip 42, heat dissipation nature can be improved.

[0004]The hollow 52 by spinning is formed in the prescribed position of the printed circuit board 51 of a metal base, each hollow 52 is equipped with LED tip 53, the lens plate 54 is stuck to the printed circuit board 51, and the LED lighting implement of composition is proposed (refer to drawing 5). When adopting the LED lighting implement of this composition, since the hollow 52 serves as a light reflector, a light reflector can be omitted without reducing optical irradiation efficiency.

[0005]In order to make unnecessary attachment of a lens plate to a printed circuit board, further again, One pair of breakthroughs 63 which penetrate the printed circuit board 61 [ near LED tip 62 ] are formed, On both sides of the printed circuit board 61, one pair of dice 64 and 65 are arranged, The method of forming the resin molding which leads the synthetic

resin for molds to the cavity 64a by the side of a lens through the breakthrough 63 from the cavity 65a by the side of a cold slug well, and has a lens characteristic is proposed (refer to drawing 6 and JP,3-60189,B).

[0006]The LED lighting implement obtained by this method can attain optic-axis doubling automatically by positioning the dice 64 and 65, and moreover, since the sticking work by adhesives is unnecessary, it can simplify fabrication operation.

[0007]

[Problem(s) to be Solved by the Invention]However, when the LED lighting implement of the composition of drawing 3 is adopted. Each LED discrete lamp 31 other than the process of manufacturing the LED discrete lamp 31 of a required number is attached to the applicable position of the printed circuit board 32, the process to solder is required and the time and effort for manufacturing an LED lighting implement as a whole will increase. The inconvenience that it is remarkable and difficult has also performed optic-axis setting all the LED discrete lamps 31. Since the LED discrete lamp 31 is only soldered to the printed circuit board 32 via the cash-drawer lead, the inconvenience that heat dissipation nature cannot be improved also has it.

[0008]When the LED lighting implement of the composition of drawing 4 is adopted, The sticking work of the light reflector 43 and the lens plate 44 is indispensable, and moreover, since it is required to perform to optic-axis double with each LED tip 42 and the lens plate 44, while the time and effort for manufacturing an LED lighting implement as a whole will increase, fabrication operation will become difficult. In sticking each board with adhesives, there is inconvenience of being easy to mix air bubbles in an adhesives layer. When the size of the printed circuit board 41, the light reflector 43, and the lens plate 44 becomes large, it originates in the difference of the thermal expansion of each board, and bends to the printed circuit board 41, and there is also inconvenience that curvature will arise.

[0009]When the LED lighting implement of the composition of drawing 5 is adopted, the inconvenience that optic-axis doubling with inconvenience, and each LED tip 53 and the lens plate 54 of being easy to mix air bubbles is required for an adhesives layer, and the fabrication operation of an LED lighting implement will become difficult cannot be canceled. It cannot originate in the difference of the thermal expansion of both boards, and cannot bend to the printed circuit board 41, and the inconvenience that curvature will arise cannot be canceled, either.

[0010]When the LED lighting implement of the composition of drawing 6 is adopted, since the printed circuit board itself does not have a condensing function at all, there is inconvenience that optical drawing efficiency as the whole LED lighting implement cannot be raised. Since the synthetic resin for molds flows into the cavity 64a by the side of a lens through one pair of breakthroughs 63 from the cavity 65a by the side of a cold slug well, The synthetic resin which flows into the cavity 64a by the side of a lens through one breakthrough 63, and the synthetic resin which flows into the cavity 64a by the side of a lens through the breakthrough of another side collide each other, it originates in a collision, and a weld line

occurs in the lens side of a resin molding. And when a weld line occurs in the lens side, the light emitted from LED tip 62 is reflected by a weld line, or it will be refracted and there is inconvenience that the optical drawing efficiency as the whole LED lighting implement will fall further. Sufficient heavy-gage printed circuit board must be adopted so that the press pressure by both dice, the resin pressure at the time of ejection, and temperature can be borne, and as a result, there is also inconvenience that an LED lighting implement will be enlarged.

[0011]

[Objects of the Invention] This invention is made in view of the above-mentioned problem, and it aims at providing the LED lighting implement which can simplify fabrication operation, while being able to raise optical drawing efficiency.

[0012]

[Means for Solving the Problem]An LED lighting implement of claim 1 for attaining the above-mentioned purpose, While being equipped with a LED tip to a printed circuit board of a metal base where it comes to form a hollow by spinning in a prescribed position so that it may be located in a hollow, The 1st resin molding portion that at least two breakthroughs are formed in a neighborhood prescribed position of a LED tip, and is located in the LED tip mounting surface side, and has a lens characteristic, and the 2nd resin molding portion located in the LED tip non-mounting surface side are really formed through a breakthrough.

[0013]An LED lighting implement of claim 2 has a cut mark of shape corresponding to a synthetic resin injection gate in a prescribed position where the 1st resin molding portion does not have on a lens characteristic substantially. That is, the 1st resin molding portion does not have a weld line substantially.

[0014]

[Function] Since it is equipped with the LED tip to the printed circuit board of the metal base where it comes to form the hollow by spinning in a prescribed position so that it may be located in a hollow if it is an LED lighting implement of claim 1, The thinning of a printed circuit board is possible, moreover, when a hollow functions as a reinforcing member, modification near [ at the time of shaping of a resin molding ] the LED tip applied part can be prevented, and the slant face of a hollow can be operated as a light reflection section.

Therefore, the drawing efficiency of light can be raised. And the 1st resin molding portion that at least two breakthroughs are formed in the neighborhood prescribed position of a LED tip, and is located in the LED tip mounting surface side, and has a lens characteristic, Since the 2nd resin molding portion located in the LED tip non-mounting surface side is really formed through the breakthrough, a resin molding is in the state with which the printed circuit board was equipped firmly as a whole, and exfoliation resulting from external force, vibration, etc., etc. can be prevented certainly.

[0015]If it is an LED lighting implement of claim 2, while the 1st resin molding portion has a cut mark of the shape corresponding to a synthetic resin injection gate in the prescribed position which does not have on a lens characteristic substantially, Since the 2nd resin

molding portion has a weld line, the inconvenience that a weld line affects the lens characteristic of the 1st resin molding portion can be prevented beforehand, and the drawing efficiency of light can be raised further by extension.

[0016]

[Example]Hereafter, the accompanying drawing in which an example is shown explains this invention in detail. While drawing 1 is drawing of longitudinal section showing one example of the LED lighting implement of this invention with one pair of dice and the hollow 2 by spinning is formed in the prescribed position of the printed circuit board 1 of a metal base, One pair of breakthroughs 3 are formed near the hollow 2, the prescribed position of the above-mentioned hollow 2 is equipped with LED tip 4, and it is electrically connected by the wire bonding 4a to the circuit pattern which is not illustrated. While having the lens side cavity 5a which has a spherical part which follows a cylinder part and a cylinder part, the die 5 which one pair of dice 5 and 6 are arranged on both sides of the printed circuit board 1, and is located in the LED tip mounting surface side, The die 6 located in the LED tip non-mounting surface side has the fixed side cavity 6a which has only a cylinder part. The above-mentioned die 5 has the synthetic resin injection gate 5b which carries out an opening to the cylinder part prescribed position of the lens side cavity 5a.

[0017]Therefore, an LED lighting implement can be easily obtained as follows only by pouring in the synthetic resin for molds which has translucency in the lens side cavity 5a through the synthetic resin injection gate 5b. That is, the lens side cavity 5a is first filled up with the synthetic resin injected into the lens side cavity 5a, it ranks second, and is injected into the fixed side cavity 6a through one pair of breakthroughs 3. Since the number of inlets is one in injecting a synthetic resin into the lens side cavity 5a, there is no generating of a weld line. If a synthetic resin is in charge of being poured into the fixed side cavity 6a, since a synthetic resin flows in almost simultaneous through one pair of breakthroughs 3, the weld line 6b occurs. However, since the fixed side cavity 6a is a LED tip non-mounting surface side, the weld line 6b does not affect the lens characteristic of a resin molding. Of course, the LED lighting implement obtained eventually will have the cut mark 5c with 5 d of lens parts (1st resin molding portion) equal to the shape of the synthetic resin injection gate 5b fabricated by the lens side cavity 5a. The fixed side portion (2nd resin molding portion) 6c fabricated by the fixed side cavity 6a may have the weld line 6b. And 5 d of lens parts and the fixed side portion 6c will be connected with one by 6 d of joining segments fabricated by the breakthrough 3. As a result, a part of light emitted from LED tip 4 is reflected by the slant face of the hollow 2, and the great portion of light emitted from LED tip 4 is led to the front direction of the hollow 2. And since it is condensed by the spherical part of a resin molding, optical drawing efficiency can be raised remarkably as a whole.

[0018]While it is preferred as the above-mentioned synthetic resin that a molecular weight uses the thermoplastics of 15000-28000 and being able to prevent generating of the air bubbles resulting from the viscosity of resin becoming high, HIKE, the insufficiency of restoration, etc., a crack, a crack, exfoliation, etc. resulting from a thermal shock can be

prevented. However, it is much more preferred that molecular weights are 18000-25000. By using thermoplastics, a cheap material can be used and it will have an advantage, like the kind of material is abundant, manufacture of a die is easy, and equipment can also be made cheap.

[0019]

[Example 2] Drawing 2 is drawing of longitudinal section showing other examples of the LED lighting implement of this invention with one pair of dice, and a different point from drawing 1 is only a point of having formed the wrap silicon resin 4b for LED tip 4 and the wire bonding 4a. Therefore, in the case of this example, since a stress relaxation operation can be demonstrated with the silicon resin 4b, the wire break and LED tip destruction resulting from HIKE of resin for molds, etc. can be prevented beforehand. Since there is specifically hundreds of times or more of endurance to a thermal shock (-40 \*\* - not less than 120 \*\*) if the silicon resin 4b is used, a wire break and LED tip destruction can be prevented certainly. As a result, sufficient reliability can be given also to use on the outdoors. However, when the fall of some thermal shock resistance is permissible, it is also possible to use an epoxy resin.

[0020]

[Effect of the Invention] As mentioned above, the invention of claim 1 does so the characteristic practical effect that the reinforcement function and reflex function of a hollow by spinning can raise optical drawing efficiency remarkably while being able to attain easily the miniaturization of the LED lighting implement accompanying the thinning of a printed circuit board.

[0021]Since the invention of claim 2 does not have generating of the weld line which affects the lens function of a resin molding, it does so the characteristic practical effect that optical drawing efficiency can be raised further.

[Translation done.]